

Non-kinetic Tasks and Supporting Sociocultural Information

David A. Krooks, Ph.D., and Chandler M. Armstrong
U.S. Army Engineer Research and Development Center

CEERD-CN-C

PO Box 9005

Champaign, IL 61826-9005

217-373-3432, 217-373-3436

david.a.krooks@usace.army.mil, chandler.m.armstrong@usace.army.mil

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ABSTRACT: *In June 2011, the Engineer Research and Development Center started a research project aimed at understanding the connection between Civil Affairs (CA) tasks and the sociocultural information needed to support the conduct of those tasks. The project, called CALICO (Civil Affairs Language Informing Cultural Operations), used manual and automated content-analysis techniques to arrive at an understanding of what Army doctrine (as represented in CA training manuals) reveals about the connection between CA tasks and supporting sociocultural knowledge. One motivation for the work is the need to define CA tasks in such a way that they can be represented in a Battle Management Language (BML) that can support the production and interpretation of digital operations orders (DOOs). BMLs are at present able to support DOOs that include tasks in traditional, kinetic warfare (e.g., ATTACK, DEFEAT, TAKE, HOLD), but research is needed on the incorporation of non-kinetic tasks. The incorporation of non-kinetic tasks into a BML would enable DOOs to be constructed, issued, and interpreted for Phase 0 (Shaping) operations and Humanitarian Assistance and Disaster Relief (HA/DR) operations. Previous research demonstrated that non-kinetic tasks can be represented in ways consistent with BML architectures based on Lexical Functional Grammar, but research has not extended to the question of what sociocultural information is relevant to what task. CALICO analysis examines CA training texts tagged using a schema that emerged from the texts themselves rather than a taxonomy developed independently for another purpose (such as JC3IEDM). This paper describes the tagging effort as part of connecting specific non-kinetic tasks to the sociocultural knowledge that supports their execution.*

1. Introduction

The experiences of the last twelve years in Iraq and Afghanistan have taught the U.S. Army, and indeed, the Department of Defense as a whole, the high cost in blood and treasure of failure to achieve a deep understanding of the populations whom our operations seek to support in pursuit of our national security interests (see e.g., reference [1]).

In order to be useful in automated decision support environments (e.g., command and control [C2]) and modeling and simulation (M&S), the military's operational tasks must be describable in a language with maximal specificity and minimal ambiguity. One such language is battle management language (BML). Research has determined that kinetic tasks (such as "take" and "hold") can be described and communicated in a BML. Because the military has been conducting well

defined force-on-force warfare for centuries, there is a shared model that has been tested and refined and that is expressed step-by-step in field manuals (FMs) and has been made routine in training exercises. Research has established that the fundamental rules of kinetic actions can be represented in a grammar (see references [2] through [6]). The lexicon for kinetic tasks is well articulated. It has also proven possible to extend the range of BML to encompass geospatial information (see reference [7]).

What has not been well articulated in military terms is non-kinetic tasks. Doctrine describes in general terms what should be accomplished in Civil Affairs Operations (CAO) in accordance with the views of subject matter experts (SMEs). FM 3-57, *Civil Affairs Operations* (reference [8]), provides a foundation for defining the tasks, objectives, and targets of CAO, and the cultural and

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14. ABSTRACT

In June 2011, the Engineer Research and Development Center started a research project aimed at understanding the connection between Civil Affairs (CA) tasks and the sociocultural information needed to support the conduct of those tasks. The project, called CALICO (Civil Affairs Language Informing Cultural Operations), used manual and automated content-analysis techniques to arrive at an understanding of what Army doctrine (as represented in CA training manuals) reveals about the connection between CA tasks and supporting sociocultural knowledge. One motivation for the work is the need to define CA tasks in such a way that they can be represented in a Battle Management Language (BML) that can support the production and interpretation of digital operations orders (DOOs). BMLs are at present able to support DOOs that include tasks in traditional, kinetic warfare (e.g., ATTACK, DEFEAT, TAKE, HOLD), but research is needed on the incorporation of non-kinetic tasks. The incorporation of non-kinetic tasks into a BML would enable DOOs to be constructed, issued, and interpreted for Phase 0 (Shaping) operations and Humanitarian Assistance and Disaster Relief (HA/DR) operations. Previous research demonstrated that non-kinetic tasks can be represented in ways consistent with BML architectures based on Lexical Functional Grammar, but research has not extended to the question of what sociocultural information is relevant to what task. CALICO analysis examines CA training texts tagged using a schema that emerged from the texts themselves rather than a taxonomy developed independently for another purpose (such as JC3IEDM). This paper describes the tagging effort as part of connecting specific non-kinetic tasks to the sociocultural knowledge that supports their execution.

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social domains relevant to CAO have been identified on the basis of experience.

To describe CAO in a BML, one must first establish the variety and nature of CA tasks empirically. In other words, one must answer the questions: “What is the scope of what we want to describe, in terms of tasks, objectives, and targets?” In simpler terms, “Who needs to do what and with/for whom to accomplish the CA mission?” The foundation for the answers to these questions is laid in doctrine that specifically addresses CA tasks: FM 3-57 and FM 3-05.401, *Civil Affairs Tactics, Techniques, and Procedures* (reference [9]). What is needed in addition to an understanding of CA tasks is a way to capture and represent sociocultural information that is firmly grounded in what the Army already says it is training its Soldiers to do.

The Army’s doctrinal approach to sociocultural information is encyclopedic (see especially Appendix A to reference [9]). It is not possible to manage encyclopedic information either in a decision support system or in an M&S environment. Thus, it is crucial to begin to establish what portion of the universe of available information is actually relevant to a given task. The content analysis of CA texts addresses the question of relevance by discovering what sociocultural information is related to what CA tasks.

2. The corpus

Previous research (see reference [10]) led to the conclusion that CA FMs do not themselves include enough detail to delimit specific tasks and connect each of those tasks to the agents who perform them. Instead, it was proposed that Army training texts make better targets for content analysis because they specify the tasks the Army says its CA Soldiers need to accomplish and specify the agents it trains to accomplish those tasks. Content analysis will expose patterns of tasks, agents, and allied sociocultural information in *Soldier’s Manual and Training Guide, MOS 38B, Civil Affairs Soldier, Skill Levels 1 through 4* (reference [11], referred to hereinafter as ‘SMTG’), with a view to understanding what actors need what information for what tasks.

The SMTG is foundational to CALICO’s analytical process; indeed, it is normative for that process in the

sense that it both provides evidence for what needs to be coded and is the basis for argumentation concerning how it ought to be coded. Although FM 3-57 is occasionally consulted for help in resolving problems presented by the text, the SMTG is the principle guide and arbiter for the coding schema. Unfortunately, the SMTG is an FOUO document the contents of which cannot be shared outside USG and contractors to USG. That fact constrains what information can be presented in this forum, but we hope to provide enough information here to raise awareness and stimulate discussion.

3. The CALICO coding schema

The coding schema is a set of tags (applied to words or phrases in the CALICO corpus) that label the concepts represented in a word or phrase. The schema consists of four components: entity tags, descriptor tags, verb tags, and culture tags. Verb tags went largely unused in the project and will not be discussed in this paper. Other tag types are described below. The schema structure is based loosely upon WordNet (see reference [12]) hierarchies and relations, but most components were developed inductively. CALICO project members sampled the corpus and developed tags designed to optimize coverage of concepts in the corpus while keeping the overall schema simple.

Tag structure is hierarchical, so that each tag can be extended to a greater degree of specificity. All entity tags are, in fact, extensions of the ‘entity’ parent; for example, ‘#entity/events’ is the tag for all entities that are events. The CALICO project exploited this feature only conservatively. The only tags so extended are entity tags, and only the ‘#entity/agents’ tag has been extended beyond the base entity type.

3.1 Entity tags

Entity tags describe ‘is-a’ relationships; for example, Washington, D.C. ‘is-a’ place, and the president ‘is-a’ agent. Every noun must have at least one entity tag, because everything ‘is-a’ something. CALICO currently employs 14 entity tags:

- agents
- agents/us
- agents/us/m

- agents/us/m/ca
- events
- info
- materials
- organizations
- physical_infrastructures
- places
- services
- social_infrastructures
- technical_capabilities
- time.

As noted, these tags are loosely based on the WordNet noun hierarchy, wherein all nouns are ultimately 'entities.' We selected entities for the schema based upon the concepts observed in the SMTG. Most of these are self-evident; for example, places, times, events, information, and materials are all central to military operations. Other entities are more complex or subtle; for example, social infrastructure, physical infrastructure, and technical capabilities. These are all entities whose need and function may not be intuitively obvious but ultimately seemed indispensable.

3.2 Descriptor tags

Descriptor tags describe or qualify entities; for example Washington, D.C. is-a 'political' place, and the president is-a 'political' agent. Descriptor tags are analogous to adjectives in natural language. Entities may have as many descriptor tags as needed, and they may have no descriptors if that is most appropriate. CALICO currently features 45 descriptor tags. The set of descriptor tags is the most malleable in the coding schema, and CALICO actively added, deleted, or merged these tags throughout the course of code application and analysis. Descriptor tag usage patterns are also more varied than those of entities or culture tags. Some descriptors are common, such as '#civilian,' '#military,' '#public,' and '#private,' while others are so narrowly defined they have only limited application, such as '#transition,' '#extremist,' or '#language.'

3.3 Culture tags

Culture tags are used to mark whose culture is referred to in a phrase. The options in CALICO's context are '#us' (i.e., United States), '#hn' (i.e., host nation [HN]), or

'#non' (i.e., no particular cultural reference, 'other'). Even in a document such as the CA SMTG, which is used in the training of the Soldiers whose specialty is interaction with the local populace, most of the phrases in fact refer to U.S. culture. All descriptions of Army organizations, Army bureaucratic processes, and Army protocol are examples of U.S. culture. HN culture could include these same entity types, but it also includes descriptions of HN geography, politics, culture, and civil or municipal systems, for example. The 'no-culture' or 'other' tag '#non' is not so much non-cultural as it is ambiguously cultural. This tag is reserved for entities that have broad cultural associations, such as inter-governmental organizations (IGOs). The culture tags help CALICO analysts mark who is being talked about, U.S. or HN, and to retrieve for analysis only those phrases explicitly tagged with '#hn.' That leads to CALICO's operational definition of 'sociocultural information,' namely, any word or phrase to which some entity tag was applied (typically along with one or more descriptors) with '#hn.'

3.4 Tagging and its limitations

We determined to tag the CA texts with a set of controlled, carefully vetted tags for two reasons. First, BML requires a simple, austere representation of tasks and information. The CALICO tags are abstractions or generalizations of sociocultural information that can be used consistently and unambiguously to represent that information. Second, the tags allow one quickly, if coarsely, to summarize the data in the corpus for statistical analysis. This allows one to understand broadly what types of information the Army finds most relevant and to expose relationships between types of information. For example, the Army might find information about civilians particularly relevant, especially information about social infrastructure in the area of operations.

One of the limitations to using a tagging schema is that, although it is consistent and unambiguous, the resolution of the representations may be insufficient. One can tag many things as 'social infrastructure,' for example, but the tagging system may not possess the tags needed to represent the nuances or granularity that may also be important. We can add qualifier tags, such as 'civilian social infrastructure.' This does solve some of the resolution problem, but there could always be additional,

important, information left uncoded. One could keep adding new tags to capture any relevant information, but at some point the tagging system will become more burdensome than using natural language, and the goals of simplicity and austerity are defeated. The task is to strike the right balance between parsimony and completeness. A related limitation is consistency of tagging. Especially as the tagging system becomes more complicated, it is more difficult to ensure tags are used consistently. A code book might be developed to help coders apply the tags correctly, but with more tags and more concepts to be tagged, the chance of human error increases. It is likely that semi-automated tagging could ameliorate this situation somewhat.

4. Army Tasks

An Army task is “a clearly defined and measurable activity accomplished by individuals and organizations. It is the lowest behavioral level in a job or unit that is performed for its own sake. It must be specific; it has a definite beginning and ending; may support or be supported by other tasks; has only one action and; therefore, is described using only one verb; a task is performed in a relatively short time; and it must be observable and measurable” (reference [11], p. 1-4).

An example from the Army Universal Task List (reference [13], p. 2-27, the distribution of which is not limited as the SMTG’s is) is “Conduct Civil Support Operations.” Each such task represented in the CA training manuals is constructed of a number of parts, only one of which is important here, namely what are called “performance steps.” Performance steps are lists (ordered either sequentially or logically) of the individual activities that lead to completion of a task. Each is presented as a command:

- Determine the purpose of X
- Establish the number of Y’s in the area of operations.
- Conduct an assessment of Z
- Identify the key B’s in the operational environment
- Assess the condition of C
- Collect information related to Q
- Document the condition of the local R’s.

CALICO’s unit of analysis was the task, and its interest was in the sociocultural information that accompanied the performance steps within each analyzed task.

5. CALICO Tagging

CALICO focused on tagging and analyzing the objects of the verbs in the performance steps that make up certain CA tasks. Since these are **Civil Affairs** tasks (rather than Maneuvers tasks or Fires tasks, for example), one might expect a focus on the civil component of the operational environment. Indeed, the SMTG includes a large number of different phrases that are used to refer to the civilian populace:

- Civil component
- Civil society
- Civil population
- Civilians
- Civilian populace
- Civilian population
- Local civilians
- Local civilian population
- Local civilian populace
- Local individuals
- Local nationals
- Nationals
- Their own people (i.e., persons subject to HN authorities)
- Children
- Non-military personnel
- Noncombatants.

The string ‘#entity/agents #civilian #hn’ would be applied to each of these phrases or words. That same string can then be used as the starting point for distinguishing types of civilians within the populace as a whole by adding tag(s):

- #entity/agents #civilian #dislocated #hn #non - refugees
- #entity/agents #civilian #licit #hn - citizens of the HN
- #entity/agents #civilian #non - third-country nationals
- #entity/agents #civilian #communication #hn #non #us - journalists

Here are examples of how the tagging schema was applied:

- If a performance step required identifying the people employed in the HN public administration, that object phrase would be tagged
 - #entity/agents #administrative #public #hn
- If a performance step required identification of civilian organizations in the area of operations, the following string would be applied to that phrase:
 - #entity/organizations #civilian #hn
- If a performance step were to mandate the development of knowledge concerning the times at which agricultural activities occur, that phrase would receive the tag:
 - #entity/events #entity/time #agriculture #hn
- If a performance step were to express an interest in the civilians in the area who are employed, that phrase would receive the string
 - #entity/agents #civilian #economy #hn
- If a performance step were to express a concern with hospitals or clinics available to civilians, that phrase would be tagged
 - #entity/physical_infrastructures #civilian #health #hn.

Another way to conceptualize something of the nature of the CALICO coding schema is to consider the categories under which CA Soldiers organize the information they collect. CA Soldiers use the acronym 'ASCOPE' as a mnemonic device for these categories: **A**reas, **S**tructures, **C**apabilities, **O**rganizations, **P**eople, **E**vents. Since CALICO's coding schema emerged from the needs presented by the SMTG, it is not surprising that there should be a close correspondence between the entity tags and the ASCOPE categories:

- **Areas** - #entity/places
- **Structures** - #entity/physical_infrastructures
- **Capabilities** - #entity/technical_capabilities
- **Organizations** - #entity/organizations
- **People** - #entity/agents;
#entity/social_infrastructures
- **Events** - #entity/events.

CALICO's entity tags align well with the ASCOPE categories; the main enhancement the schema provides is the addition of the '#entity/social_infrastructures' tag, which moves both the 'Organizations' category and the 'People' category beyond mere enumeration of human actors to the social and cultural structures that shape human actions. Thus, it becomes clear that the CALICO coding schema offers the possibility of representing sociocultural information in a computerized information management system.

6. The Representation of Sociocultural Information

CALICO's representations of sociocultural information are strings of tags that consist of no fewer than the following constituents, in the following order:

- At least one entity tag
- Descriptor tags, as appropriate
- One or more of the following, as appropriate: '#hn,' '#non,' '#us.'

By convention, the elements within each tag type are presented in alphabetical order.

The earlier presentation of sample tag strings is suggestive of the kinds of contrasts that can be drawn using the schema. This type of partially hierarchical representation would be subject to query in a computerized system. Indeed, both the analysis of the sociocultural content of the tags as applied in the SMTG and the analysis of relevance were based on queries run against the annotated corpus. The coding schema allows the development of queries that are quite broad and of others that are rather more granular, at the same time as vocabulary differences within and between documents are leveled by the use of tags instead of free-text searches. Such an approach would entail overhead in terms of tagging the information against which queries would be run as part of an automated decision support system. The CALICO project also demonstrated (see reference [14]) the very real possibility that tagging can be semi-automated (i.e., with a human in the loop) and thus lower that overhead.

Although some of the CALICO tags are necessarily used more than others within individual CA tasks, none of the

most highly relevant tags leads to fine sociocultural detail. Tags instead represent categories of information that could be attached to individual details for information retrieval purposes. Their multifarious combinations allow for binning of information and the construction of searches that would allow those bins to be constructed and deconstructed depending on the needs of the moment.

Content analysis using CALICO's working definition of 'sociocultural information' (as a combination of entity tags + descriptor tag[s] + '#hn') leads to the conclusion that there is a great deal of sociocultural information in the corpus. The CALICO entity tags for the most part name the ASCOPE categories, and thus those entity tags provide a framework of categories nicely consistent with CA doctrine. The descriptor tags then permit sub-classification within those broad categories. The representation of sociocultural information, therefore, is by named bins, where the bins are constructed on the fly out of tag strings. Those tag strings are surrogates for, i.e., representations of, categories of sociocultural information.

7. Relevance-to-Task in CALICO

Relevance-to-task for CALICO is essentially a statistical property, based on frequency of occurrence of descriptor tags within a task. As text, each task is treated as a bag of words in which each bit of sociocultural information is potentially relevant to (and thus *equally* relevant to) the task in question. It is therefore necessary to determine not what information is relevant to the task but instead what information is most relevant to the task.

For each task, CALICO took the following approach:

- The descriptor tags present in the task and the number of times each is applied were considered.
- The top 10% (by absolute frequency of occurrence of the '#hn' tag) of all descriptors applied in each task was identified
- All the applications of the most used tags in each task were inspected, which enables the identification of the associated bits of sociocultural information in that task
- From those associated bits of sociocultural information, key topics in the task were identified.

- Inferential statistics were used to estimate whether the tags our analysis deemed particularly relevant for a given task in the SMTG are likely to remain relevant in actual performance of the task.

This results in a view of relevance based solely on statistics related to the frequency with which tags occur inside a task. That information can be clustered, based either on similarity of content or on co-occurring entity tags.

What CALICO reveals in terms of relevance-to-task is the relative importance of sociocultural information. CALICO cannot answer the question "What sociocultural information is relevant to a task?" in granular detail. Instead, it answers the question "What categories of sociocultural information occur most frequently within a task?" There are two reasons that the first question is unanswerable. First, detailed, granular information is simply not a part of the SMTG. Only categories of information are found in the text, perhaps with an example or two of what might be included within a given category. These categories of information are captured and represented by CALICO tag strings. Secondly, the view of relevance that tag-based content analysis of a text supports is essentially a statistical property of categories of information within a task.

CALICO's view of relevance is static because the text of the SMTG is static until a CA Soldier begins to conduct a task in a specific context. As noted above, each bit of sociocultural information in an SMTG task is *potentially relevant* to (and thus *equally relevant* to) the task. These sociocultural elements in a task can be aggregated by the content analyst into topics. Some of these topics can then be characterized as more relevant than others, given some statistical cut-off. This state of affairs is a function of the nature of the text itself: The SMTG cannot include more than categories and examples, because precise sociocultural detail is profoundly context-specific.

Another question that might arise is this: "To what extent does the sociocultural information in the text contribute to an understanding of what is really important?" The information that is collected and organized using the CALICO categories needs to be situated in a framework that allows the significance of the information to be

articulated. It is not enough to collect information, as CA Soldiers know well; what is collected must be analyzed, must be interpreted, must be understood. But neither the SMTG itself nor the wider Army doctrinal context in which the SMTG is embedded provides a robust framework within which that understanding can be developed. Instead, doctrine provides organizational schemata (e.g., PMESII and ASCOPE). Information organized is one thing; information understood is another. CALICO's parent project CREATE (Cultural Reasoning and Ethnographic Analysis for the Tactical Environment) undertakes the development of frameworks and tools that make the knowledge from the social sciences available to analysts for presentation to decision makers (see reference [15]).

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Author Biographies

DAVID A. KROOKS is a social scientist at the U.S. Army Engineer Research and Development Center's laboratory in Champaign, IL. Mr. Krooks has conducted research in the areas of environmental compliance in foreign nations and in sustainability reporting and sustainability metrics. At present, he is part of a team whose work is devoted to understanding sociocultural dynamics in the operational environment.

CHANDLER M. ARMSTRONG is a sociologist at the U.S. Army Engineer Research and Development Center's laboratory in Champaign, IL. Mr. Armstrong is part of the ERDC/CERL team whose work is devoted to understanding the sociocultural dynamics of the operational environment. He is at present completing his dissertation at the University of Illinois.